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(54) **ROCKER ARM ASSEMBLY FOR THE REAR DERAILLEUR OF A BICYCLE**

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This patent is subject to a terminal disclaimer.

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(52) **U.S. Cl.** ..... **474/82; 474/80**

(58) **Field of Classification Search** ..... **474/80-82; 264/257-258; 428/61, 343**

See application file for complete search history.

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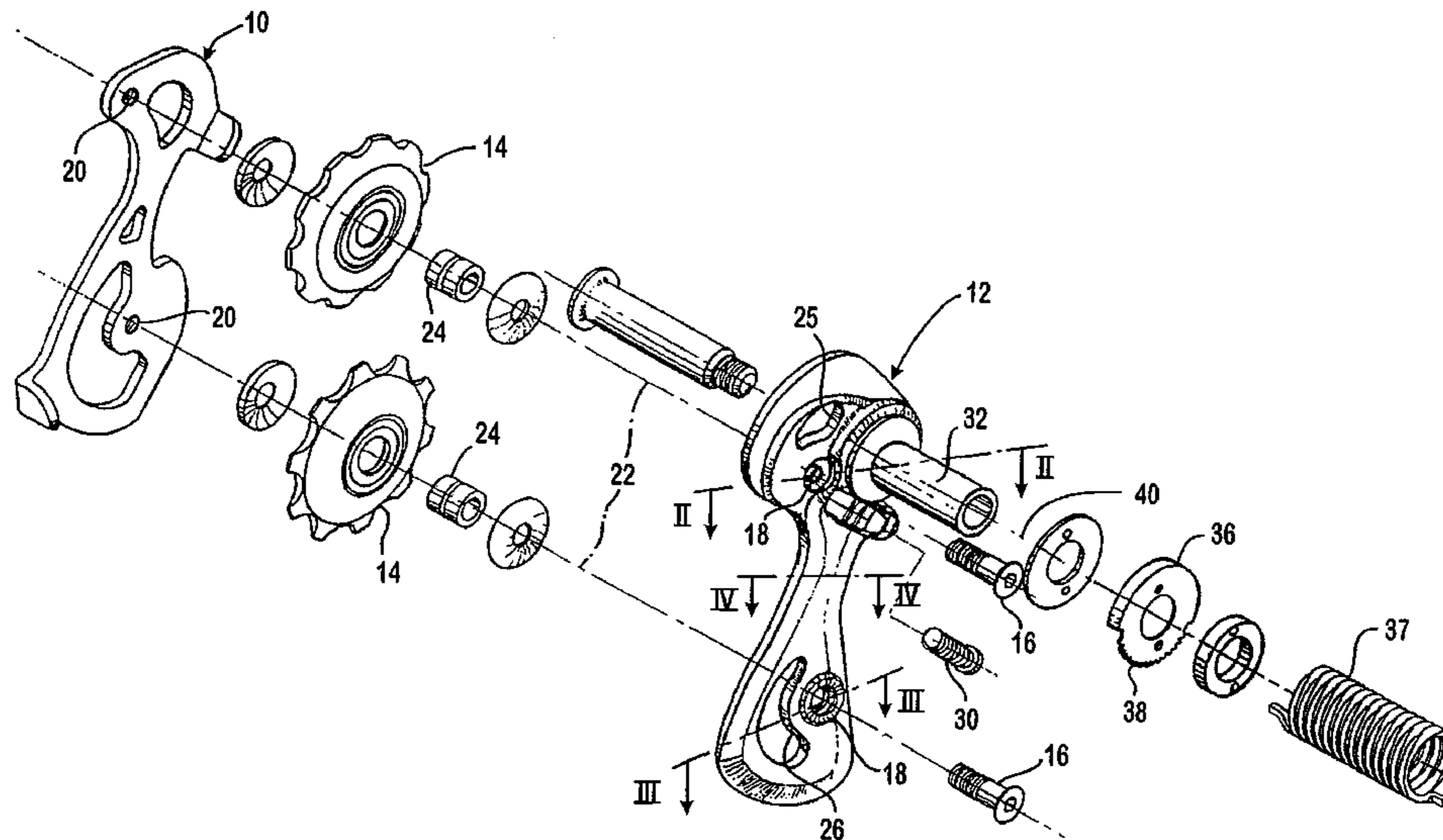
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(57) **ABSTRACT**

Rocker arm assembly for the rear derailleur of a bicycle, comprising an outer plate carrying a pivot pin, an inner plate and a pair of idle transmission wheels arranged between the outer plate and the inner plate. The inner plate is made of metallic material and the outer plate is made of a structural fiber fabric incorporated in a thermoplastic material matrix.

**8 Claims, 1 Drawing Sheet**



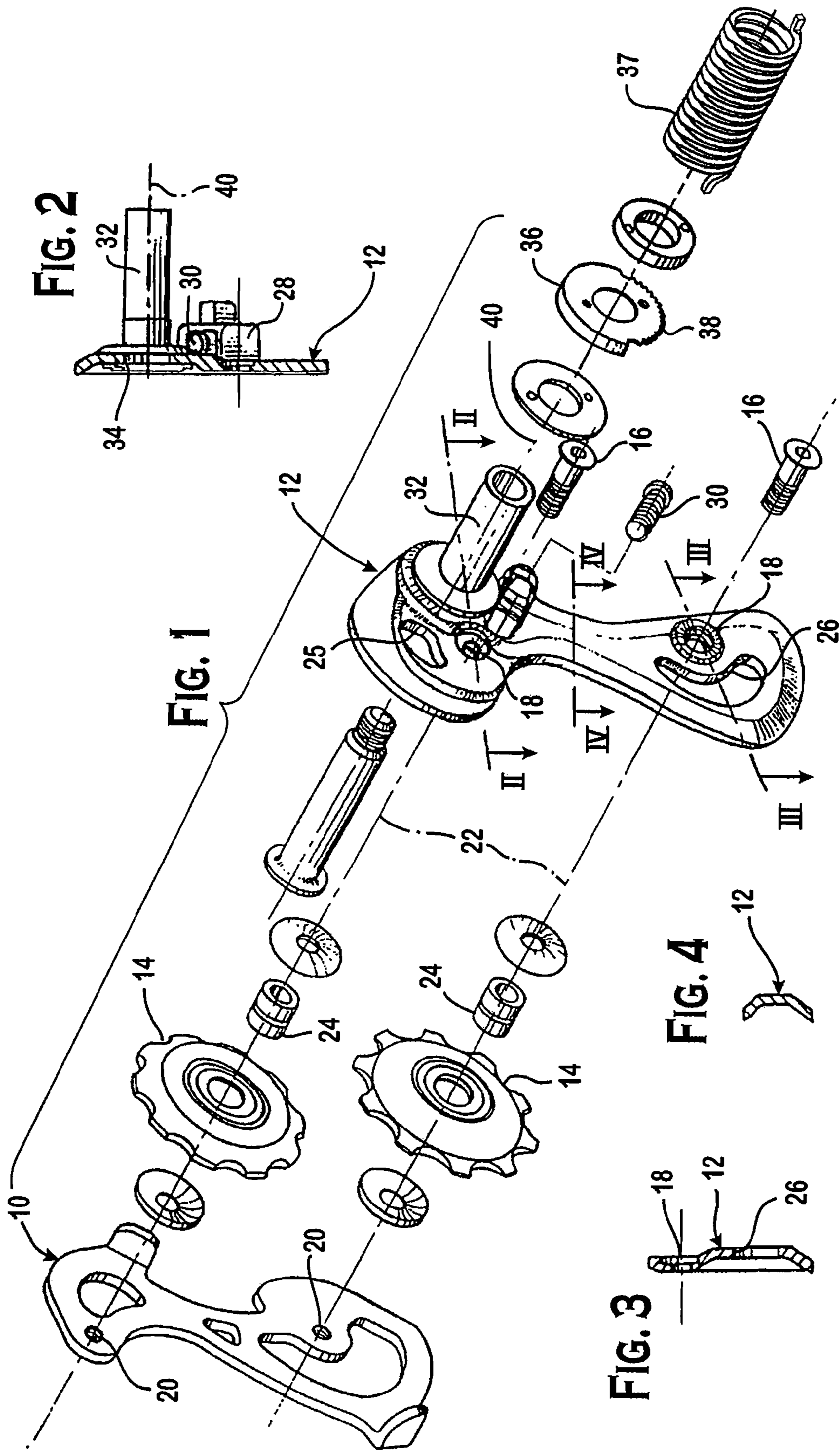
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## ROCKER ARM ASSEMBLY FOR THE REAR DERAILLEUR OF A BICYCLE

### CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Ser. No. 11/149,849, filed on Jun. 10, 2005, which issued on Apr. 8, 2008 as U.S. Pat. No. 7,354,362, which is a continuation of application Ser. No. 10/722,986, filed on Nov. 26, 2003, which issued on Jan. 24, 2006 as U.S. Pat. No. 6,988,970, which is a continuation of application Ser. No. 09/994,718, filed on Nov. 28, 2001, which issued on Feb. 3, 2004 as U.S. Pat. No. 6,685,586. All of these applications are incorporated by reference as if fully set forth herein.

### BACKGROUND

The invention relates to a rocker arm assembly for the rear derailleur of a bicycle. The rocker arm assembly comprises an outer plate carrying a pivot pin, an inner plate and a pair of idle transmission wheels arranged between the inner plate and the outer plate and intended to co-operate with the chain.

The field of components for competition bicycles is characterized by continuous research aimed at reducing the weight of single components without compromising performance, particularly in terms of structural resistance.

In rocker arm assemblies of the known kind, the front plate and the rear plate are both made of light metallic alloys and are reciprocally fastened by means of screws which define the rotation axes of the transmission wheels. The use of different materials that would provide a reduction in weight often puts problems in terms of maintaining structural resistance characteristics. Furthermore, the problem related to the dimensions of the plates of the rocker arm assembly cannot be neglected since this unit is arranged very close to the spokes of the wheel, when the chain meshes the pinion which is closest to the wheel.

In order to overcome the aforesaid drawbacks, the invention relates to a rocker arm assembly having the characteristics described herein.

### SUMMARY

The rocker arm assembly according to the invention is characterized in that the inner plate is made of metallic material and the outer plate is made of a structural fiber fabric incorporated in a thermoplastic material matrix.

This solution provides high stiffness and small thickness of the inner plate which is more affected by problems of occupied space to prevent interference with the wheel. The outer plate has less problems of stiffness and occupied space and can be made of a lighter material, for example a composite carbon fiber-based material. Considering that the inner plate is made of metallic material, it can be provided with threaded holes as in the traditional solutions, for engaging the threaded ends of the screws defining the rotation axes of the transmission wheels. If the inner plate were also to be made of structural fiber fabric incorporated in resin, the problem of making the plate thicker would arise to ensure the same resistance to flexion and the increased thickness would cause an interference with the spokes of the wheel. Furthermore, making threaded holes in fiber fabric incorporated in a plastic material matrix would not be possible and threaded metallic inserts would have to be used. This would increase the problem of occupied space of the inner plate.

### BRIEF DESCRIPTION OF THE DRAWING(S)

The invention will now be described, by the way of example only, with reference to the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of a rocker arm assembly according to the invention, and

FIGS. 2, 3 and 4 are cross-sections according to lines II-II, III-III and IV-IV in FIG. 1, respectively.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

With reference to the drawings, FIG. 1 illustrates the rocker arm assembly comprising an inner plate 10, and outer plate 12 and a pair of transmission wheels 14. The plates 10, 12 are fixed in a conventional way by means of a pair of screws 16 which extend through respective non-threaded holes 18 of the outer plate 12 and engage respective threaded holes 20 of the inner plate 10. In a conventional way, the screws 16 define the rotation axes 22 on which the transmission wheels 14 are freely rotationally mounted. Respective bushings 24 are interposed between the screws 16 and the wheels 14.

According to the invention, the inner plate 10 is made of metallic material, preferably aluminum or aluminum alloys, while the outer plate 12 is made of a structural fiber fabric incorporated in a plastic material matrix.

Preferably, the fabric is a carbon based fabric and the plastic material is preferably of the thermosetting type. The outer plate 12 is made by compression moulding of sheets readily available on the market, consisting of sheets of structural fibres coated with thermoplastic resin. During moulding, the outer plate assumes the definitive shape illustrated in the figures, with a transversal cross-section shaped as a shallow channel, as illustrated in FIGS. 3 and 4, to increase the flexion and torsion stiffness. The holes 18 for the screws 16 and lightening holes 26 are formed during moulding. Preferably, an integral element 28 made of plastic material projecting from an outer face of the outer plate 12 is also formed during moulding. The element 28 carries a freely rotating worm screw 30.

A hollow pin 32 of metallic material, preferably steel, is fastened by caulking in a hole 34 of the plate 12. A regulation wheel 36 whose toothing 38 meshes the worm screw 30, is rotationally mounted on the pin 32. The regulation wheel 36 co-operates with a return spring 37 which tends to rotate the rocker arm assembly around the axis 40 of the pin 32. The relative position of the wheel 36 with respect to the pin 32 can be varied by turning the worm screw 30 and consequently varying the pre-load of the return spring 37.

In the assembled configuration, the inner plate 10 and the outer plate 12 form a cage structure which rotationally carries the transmission wheels 14. The fact of using a metallic material for the inner plate 10 and a structural fiber fabric incorporated in a thermoplastic resin for the outer plate 12 results in a situation which is an ideal compromise in terms of reducing weight and maintaining structural resistance with respect to the flexion stress, without causing problems of interference with the spokes of the wheel in the position in which the chain engages the pinion which is closer to the wheel.

What is claimed is:

1. A rocker arm assembly for a rear derailleur of a bicycle, the assembly comprising an outer plate having a pivot pin, an inner plate and pair of idle transmission wheels arranged between the outer plate and the inner plate,

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wherein the inner plate is made of metallic material and the outer plate is made from a lighter weight non-metallic material.

**2.** The rocker arm of claim **1**, wherein said outer plate has a cross-sectional profile that essentially has a shape of a shallow channel.

**3.** The rocker arm of claim **1**, wherein the outer plate is obtained by compression molding.

**4.** A rocker arm assembly for a rear derailleur of a bicycle, the assembly comprising an outer plate made of a plurality of fiber compression-molded fabric sheets, a metallic inner plate, and a pair of idle transmission wheels arranged between the outer plate and the inner plate.

**5.** A rocker arm assembly for a rear derailleur of a bicycle, the assembly comprising an outer plate having a pivot pin, an inner plate and a pair of idle transmission wheels arranged between the outer plate and the inner plate,

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wherein the inner plate is made of metallic material and the outer plate is molded of a non-metallic material, and has a cross-sectional profile of a shallow channel.

**6.** A rocker arm assembly for a bicycle rear derailleur, the assembly comprising:

an outer plate of a plastic material matrix;  
an inner plate of a metallic material that is of a heavier weight than the plastic material matrix of the outer plate;  
and

a pair of idle transmission wheels positioned between the inner and outer plates on rotational axis secured to the inner plate.

**7.** The assembly of claim **6** wherein the outer plate further comprises a metallic pin that project from the outer plate in a direction opposite the inner plate.

**8.** The assembly of claim **7** wherein the pin carries a regulation wheel that is adjusted with a worm screw.

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